THE MICRO-PALEONTOLOGY OF THE LOWER FORMATIONS

OF THE GULF SERIES OF TEXAS

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THE MICRO-PALEONTOLOGY OF THE LOWER FORMATIONS OF THE GULF SERIES OF TEXAS

THESIS

Presented to the Faculty of the Graduate School of
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ment of the Requirements

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By

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PREFACE

The subject of this paper was suggested to the writer by Professor F. L. Whitney, under whose direction the paper has been prepared. He has at all times given his constructive criticism and advice. Professor F. M. Bullard has also offered valuable suggestions and advice.

The photographs were taken from "Foraminifera of the Cretaceous of Central Texas", by Dorothy Ogden Carsey, "Foraminifera of the Midway Formation in Texas", by Helen Jeanne Plummer, and "Recent Foraminifera", by James M. Flint.

For this aid the writer wishes to express his appreciation.

CONTENTS

THE MICRO-PALEONTOLOGY OF THE LOWER FORMATIONS OF THE GULF SERIES OF TEXAS

INTRODUCTION

Due to the fact that there has been no published detailed study of the foraminifera of the Eagle Ford shale and the Woodbine sand in Texas, the writer has attempted to make an intensive investigation of the micro-fauna of these formations.

The Woodbine formation, with a thickness of approximately 400 feet in Grayson County, has proved very unproductive as far as foraminifera are concerned. They were found at only one horizon, this being a shale bed near the top of the formation, but they were so poorly preserved that neither their genera nor their species could be determined. In Travis County, based on the investigation conducted by Professor F. L. Whitney and Mr. R. L. Cannon, the lower 15 feet of what has been called Eagle Ford may possibly be Woodbine in age. In these beds the following species occur: Textularia semicomplanata Carsey, Textularia globulosa Ehrenberg, Nodosaria consorbrina d'Orbigny, Nodosaria communis d'Orbigny, Nodosaria filiformis d'Orbigny, Nodosaria

obliqua Linnaes, Cristellaria gibba d'Orbigny, Cristellaria crepidula Fitchtel and Moll, Globigerina cretacea d'Orbigny, Globigerina rosetta Carsey, Discorbis correcta Carsey, Marginulina regularis d'Orbigny, and lithistid sponge spicules.

The Eagle Ford formation contains, in some localities, numerous foraminifera, although the majority of the various species are represented by only a few individual specimens. Travis and Grayson counties have furnished all of the samples that the writer has examined. The Eagle Ford in Travis County is about 27 feet thick, whereas, in Grayson County its thickness is approximately 400 feet. Dorothy Ogden Carsey, in "Foraminifera of the Cretaceous of Central Texas", lists the following species found in the Eagle Ford formation: Textularia globulosa Ehrenberg, Cristellaria gibba d'Orbigny, Globigerina cretacea d'Orbigny, Globigerina rosetta n. sp. In Travis County the Eagle Ford is abundantly supplied with foraminifera which include the following species: Textularia globulosa Ehrenberg, Frondicularia projecta Carsey, Globigerina cretacea d'Orbigny, Globigerina rosetta Carsey, Discorbis correcta Carsey, Discorbis conica n. sp.,

Truncatulina bouldini n. sp., and Verneulina whitneyi n. sp.

In Grayson County the Eagle Ford yields only a very few foraminifera. They are very scattered and serve in no way as horizon markers. The following species have been noted: Textularia globulosa Ehrenberg, Textularia globifera Reuss, Guadryina filiformis Berthelin, Lagena sulcata Walker and Jacob, Nodosaria communis d'Orbigny, Polymorphina lactea (Walker and Jacob), Globigerina cretacea d'Orbigny, Rotalia cretacea Carsey, and Anomalina sp?

DESCRIPTION OF THE SPECIES

FAMILY TEXTULARIDAE

SUBFAMILY TEXTULARINAE

TEXTULARIA SEMICOMPLANATA CARSEY

PLATE I, FIGURE I

Test finely arenaceous, broad, slightly flattened, biserial; chambers numerous, narrow; edges narrow, angular; shell thickest along the intermedial line of intersection of the chambers, an area which may be occasionally depressed; sutures extend from the median line obliquely backward and are usually depressed but not always plainly discernible; apical end is acutely angular; anterior end is wide and broadly angular; aperature oval, located in the terminal segment on the inner margin.

Length about .75 mm; width at widest portion about .6 mm. The shell may be smaller.

This species is found in the probable Woodbine in Travis County.

TEXTULARIA GLOBULOSA EHRENBERG

PLATE I, FIGURES 2a, 2b

Test biserially symmetrical, composed of very noticeable globular chambers enlarging rapidly from

very small round chambers which form a pointed initial end, to final very large bulbular segments; chambers number from ten to twelve; sutures are deeply depressed; aperture elongate, wide, with rounded ends, lying at the inner margin of the last chamber; shell calcareous.

Length up to about .7 mm.

This species is common throughout the Eagle Ford. It is also present in the probable Woodbine in Travis County.

TEXTULARIA GLOBIFERA REUSS

PLATE I, FIGURE 3

Shell like that of Textularia globulosa except that the surface is ornamented by fine parallel straitions running longitudinally.

Length up to about .7 mm.

This species is very rare in the Eagle Ford and a few were found only in Grayson County.

SUBFAMILY VERNEUILININAE

VERNEUILINA WHITNEYI N. SP.

PLATE I, FIGURES 4a, 4b

Test free, triserial, and elongate, in cross section triangular, composed of three series of segments arranged symmetrically or unsymmetrically around the long axis of the shell; segments inflated and increase in size rapidly;

walls finely arenaceous, smooth; aperture rounded and located at or near the base of the inner margin of the final chamber; some of the species are very distorted while others show a symmetrical form and some begin with a symmetrical arrangement of the segments but with the later chambers distorted.

This species is quite abundant in the upper Eagle Ford shale in Travis County.

GUADRYINA FILIFORMIS BERTHELIN

PLATE II, FIGURES 1a, 1b

Test elongate, very noticeably long, tapering sometimes slightly arcuate, wall arenaceous, smoothly cemented; chambers inflated, enlarging very gradually, arranged triserially in the very short initial portion, biserial in the remainder of the shell; sutures depressed; apical end bluntly pointed; apertural end wider with final chamber rounded to angular; aperture oval, located at the inner margin of the final chamber; surface of shell is fairly smooth.

Length varies up to a little more than 1 mm.

This species is very rare in the Eagle Ford, Grayson County producing the only specimens.

FAMILY LAGENIDAE

SUBFAMILY LAGENINAE

LAGENA SULCATA WALKER AND JACOB

PLATE II, FIGURES 2a, 2b

Test subglobular to pyriform; surface ornamented with parallel striations extending the length of the shell; apertural extremity extended into a moderate lengthened neck, bearing a round mouth; apical end usually rounded but occasionally slightly protruded.

Entire length about .25 mm.

This species is very rare in the Eagle Ford, the only specimen in our collection, being found in Grayson County.

SUBFAMILY NODOSARINAE

NODOSARIA CONSORBRINA D'ORBIGNY

PLATE III, FIGURES 1a, 1b

Test smooth, elongate, linear, arcuate, tapering, chambers about as short as they are wide, slightly inflated, becoming more so with growth, rather stout, and gradually enlarging; sutures are lines of slight constriction, and are straight; the initial end is decidedly rounded; aperture radiate, terminal, eccentric,

protruded from terminal chamber; shell calcareous, sometimes rather hyaline.

Length usually about 2 mm.

This species occurs in the probable Woodbine in Travis County.

NODOSARIA FILIFORMIS D'ORBIGNY

PLATE III, FIGURES 2a, 2b

Test long, slender, smooth, clear, somewhat curved; composed of a number of oval chambers arranged in linear series and separated by slightly depressed sutures which are sometimes very moderately oblique; chambers increased in length toward the apertural end becoming more than twice as long as wide; aperture terminal, radiate and slightly eccentric.

Length 1.5 mm. to 2 mm.

This species occurs in the probable Woodbine in Travis County.

NODOSARIA COMMUNIS D'ORBIGNY

PLATE IV, FIGURES 2a, 2b

Test elongate, tapering, somewhat curved, smooth; composed of numerous chambers becoming more inflated toward the apical end; aperture terminal, radiate, slightly elongate and eccentric; sutures oblique. Nodosaria communis differs from Nodosaria filiformis in being usually more curved, and always having distinctly oblique sutures.

Length about 1 mm.

This species is found in the probable Woodbine in Travis County and also in the lower shales of the Eagle Ford in Grayson County.

NODOSARIA OBLIQUA LINNAEUS

PLATE IV, FIGURES 1a, 1b

Test elongate, slender, tapering, linear, sometimes curved, varying in size up to rather large; surface covered with numerous, moderately coarse, longitudinal ribs, a few of which may not be continuous; sutures appear as restrictions; chambers are somewhat inflated, particularly the later larger ones; the initial chamber is often slightly larger than those immediately following, and it is terminated by a short spine; aperture radiate, terminal, a little eccentric, occurring on a slight protrusion of the final chamber; shell calcareous.

Length about 2 mm.

Nodosaria obliqua was observed only in the probable Woodbine in Travis County.

CRISTELLARIA GIBBA D'ORBIGNY

PLATE V, FIGURES 2a, 2b, 2c

Test medium sized, calcareous, entirely involute; chambers not very numerous, usually about seven or eight are visible, triangular, inflated; sutures are almost straight, clearly marked heavy lines, depressed, arising from a round, clear central node and terminating

on the periphery in a noticeable, clear, triangular enlargement, plainly marking previous apertures; periphery carinate, slightly indented on each chamber immediately following the termination of the suture; aperture radiate, located at the extremity of the final chamber.

Diameter usually about .75 mm.

This species is found in the probable Woodbine in Travis County. Here they are smaller than the usual Cristellaria gibba.

CRISTELLARIA CREPIDULA FICHTEL AND MOLL

PLATE V, FIGURE 1

Test elongate or elongate-oval, compressed, smooth, transparent; early chambers in spiral arrangement but soon change to the linear-oblique; peripheral margin rounded; early sutures not depressed but later ones slightly depressed.

Length, from .8 to 3 mm.

This species is found in the probable Woodbine in Travis County.

MARGINULINA REGULARIS D'ORBIGNY

PLATE VI, FIGURE 4

Test elongate, gently arcuate, tapering; chambers comparatively few, full, round, very smooth, first few

partially coiled; sutures slightly oblique, distinct from the beginning but becoming more and more depressed toward the oral extremity; walls fragile; aperture marginal, radiate, round, protruding.

Length up to .7 mm.

This species is found in the probable Woodbine in Travis County.

FRONDICULARIA PROJECTA CARSEY

PLATE VI, FIGURE 3

Test triangular, arrow-shaped, complanate; chambers numerous, bifurcating, except in the apical portion where they show a slight coil and occur as a projection beyond the rather straight apical edge; sutures are raised ridges and between them are surface ornamentations of small nodes either in lines or scattered; the apical end is broad and the shell tapers toward the apertural end which is pointed, and which bears at its extremity an aperture, slightly protruding and of moderate size.

Length from 1 mm. to 1.5 mm.

Fondicularia projecta was encountered in the upper Eagle Ford at the Austin Chalk contact in Travis County.

SUBFAMILY POLYMORPHININAE

POLYMORPHINA LACTEA WALKER AND JACOB

PLATE VI, FIGURES 2a, 2b, 2c

Test obtusely ovate, slightly unsymmetrical; chambers few (usually three), smooth, oblique, faintly inflated; sutures distinct, very little depressed; aperture round, radiate.

Length up to .2 mm.

The geologic range of this form is very long. It is known to have existed from the Jurassic and is present in our present seas. The only specimen found was in the Eagle Ford in Grayson County.

FAMILY GLOBIGERININAE

GLOBIGERINA CRETACEA D'ORBIGNY

PLATE VI, FIGURES 1a, 1b

Test rotaliform, comprised of about three whorls all of which are visible from the dorsal side, only the last whorl is visible on the ventral side, dorsal side usually flattened, ventral side depressed toward the center; chambers globular, highly inflated and rapidly enlarging from few very small initial ones; sutures much depressed; shell coarsely perforate,

sometimes marked with small projections; aperture in margin of final chamber, opening into umbilical depression.

Diameter about .5 mm.

This species is very common in the Eagle Ford and Woodbine and is found in these formations wherever any micro-fauna are found. In Travis County some of the washed samples appeared to be about 90 per cent Globigerina cretacea.

GLOBIGERINA ROSETTA CARSEY

PLATE VII, FIGURES 1a, 1b, 1c, 1d, 1e

Test coiled, flattened to slightly convex with surface of chambers flattened seldom inflated, but occasionally resting at an angle to the dorsal plane causing the anterior margin of each to be slightly raised; sutures sweep from the center and roundly curve on the periphery giving a subpetaloid appearance, are distinctly marked, slightly broadened and frequently ornamented by tubercles which are coarser toward the center. The periphery, formed by the extremity of the sutures, is scalloped or lobed, subcarinate and ornamented by fine excrescences. The ventral side is convex to protruded with usually only one whorl visible, and the chambers on this side are somewhat inflated with sutures marked by lines of depression sometimes

curving and extending from the periphery to the broad umbilicus. Umbilical margin of the chambers is marked on each by an extended lip; apertures open from the chambers in the final whorl into the receding umbilical vestibule; shell very finely perforate.

The width of the shell varies from .3 mm. to .7 mm., but the size is usually intermediate.

This species is moderately common throughout the Eagle Ford and Woodbine in Travis County. A few specimens were found in the Eagle Ford of Grayson County.

FAMILY ROTALIIDAE

SUBFAMILY ROTALINAE

DISCORBIS CORRECTA CARSEY

PLATE VII, FIGURES 1a, 1b

Test coiled, chambers rather numerous; dorsal side convex, showing from two to three whorls; ventral side flattened to concave; somewhat umbilicate, with only one whorl visible; chambers only slightly inflated, final one large but not thickened; sutures plainly marked, curved, often sweeping, depressed; shell calcareous covered with fine perforations.

Diameter varies from about .3 mm. to .75 mm.

This species is found in the Eagle Ford and Woodbine in Travis County.

DISCORBIS CONICA N. SP.

PLATE VIII, FIGURES 1a, 1b, 1c

Test very small, round, trochoid, the dorsal face being broadly conical and the ventral face flat; peripheral margin acute; chambers indistinct; shell composed of few whorls, strongly curved, very smooth; aperture a narrow arched opening along the edge of the final chamber between the periphery and the umbilicus.

Only one of these forms were found, the location being the upper shales of the Eagle Ford in Travis County.

TRUNCATULINA BOULDINI N. SP.

PLATE VIII, FIGURES 2c, 2b

Test coiled, usually small, finely perforate, calcareous, smooth, chambers numerous; dorsal side flat to convex and having from one to two whorls with oblique sutures which are somewhat curved; ventral side conical, showing only one whorl; sutures on the ventral side are plain and in most instances raised; chambers are gradually enlarged; the periphery rounded.

This species was observed in the upper shales of the Eagle Ford in Travis County.

ANOMALINA SP?

Test subnautiloid, ventral side convex, dorsal side a depressed spire; chambers numerous, inflated, about one and a half coils visible on each side; surface

seems to be finely perforated; sutures are smoothe lines; periphery rounded; the shell has been replaced b by pyrite and most of its characteristics hidden.

This species was found in the upper Eagle Ford in Grayson County.

ROTALIA CRETACEA CARSEY

PLATE IX, 1a, 1b

Test coiled, somewhat rotund, surface very smooth; dorsal side slightly convex showing two or three whorls; ventral surface with only one visible whorl and quite convex; chambers inflated and sutures depressed on the ventral side and in the final portion of the dorsal side; sutures clearly marked, usually curved dorsally and straightened ventrally; periphery rounded; umbilical region filled with shell material which sometimes forms a rounded node lying in a slight depression; aperture is a very narrow slit on the ventral portion of the inner margin of the final segment; shell calcareous.

The diameter of the shell is generally not over .5 mm.

This shell is found in the Eagle Ford in Grayson County.

PLATE I

PLATE I

Figure 1. Textularia semicomplanata Carsey, x 35.

Figure 2. Textularia globulosa Ehrenberg, (a), edge view; (b), side view, x 40. Cretaceous specimens.

Figure 3. Textularia globifera Reuss.

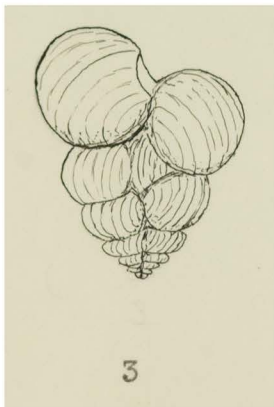
Figure 4. Verneuilina whitneyi N. Sp., (a), distorted specimen; (b), perfect specimen.

PLATE I.

1

2a

2b



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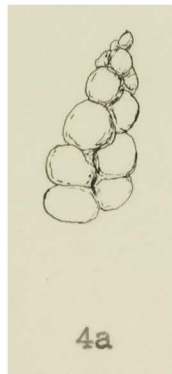

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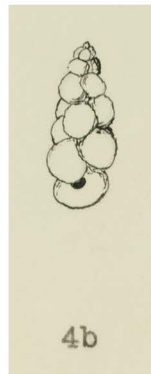


4b

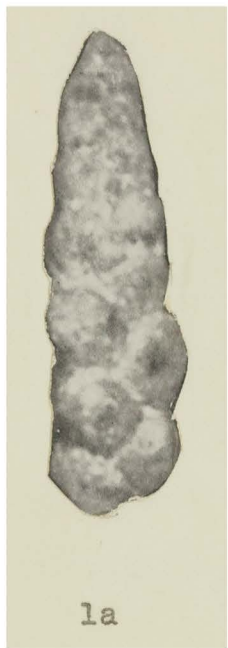
PLATE II

PLATE II

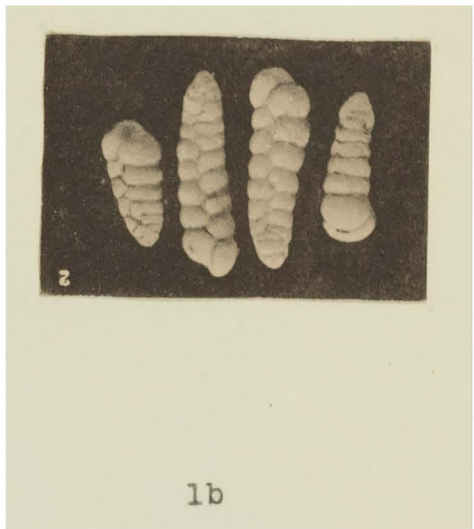
Figure 1. Guadryina filiformis Berthelin, (a), cretaceous specimen, x 35; (b) recent specimens.

Figure 2. Lagena sulcata Walker and Jacob, (a), cretaceous specimen, x 35; (b) recent specimen.

PLATE II.



1a



1b

2a

2b

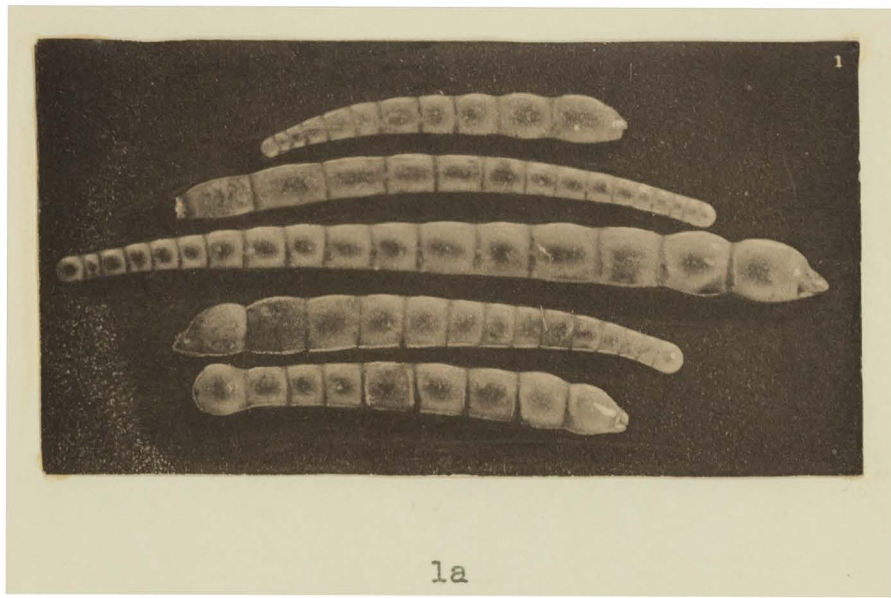
PLATE III

PLATE III

Figure 1. Nodosaria consorbrina d'Orbigny, (a), recent specimens; (b) cretaceous specimen, x 55.

Figure 2. Nodosaria filiformis d'Orbigny, (a), cretaceous specimen, x 35; (b) recent specimens.

PLATE III.



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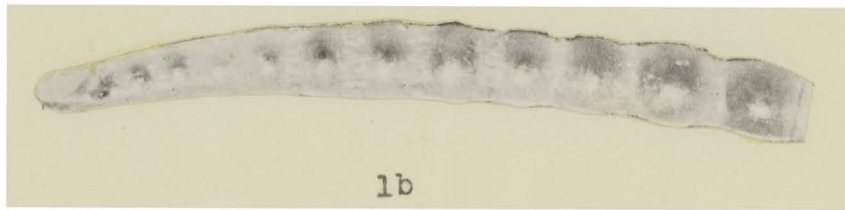

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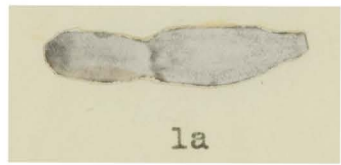

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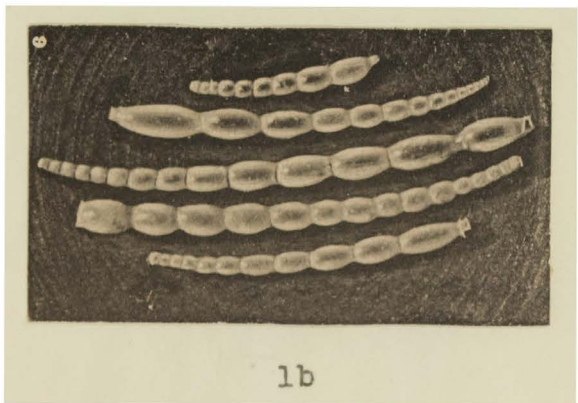


1b

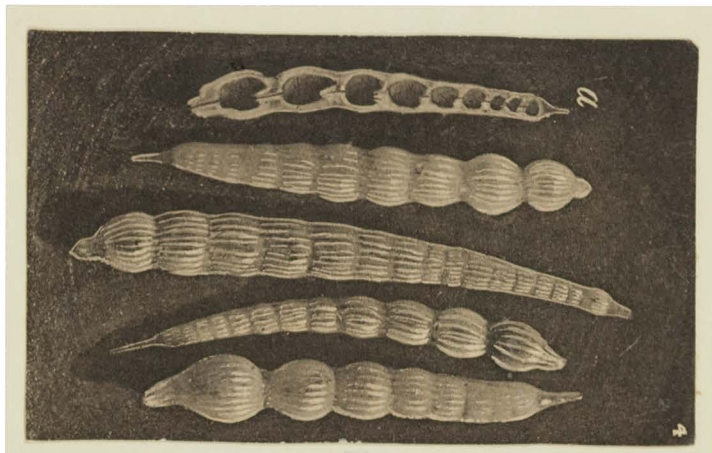
PLATE IV

PLATE IV

Figure 1. Nodosaria obliqua Linnaeus, (a), recent specimens; (b), cretaceous specimen, x 27.

Figure 2. Nodosaria communis d'Orbigny, (a), cretaceous specimen, x 35.

PLATE IV.



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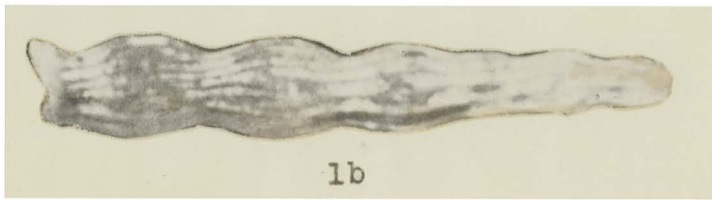

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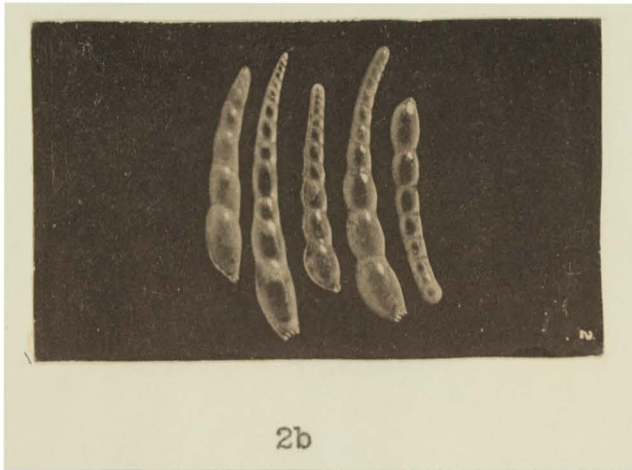


2b

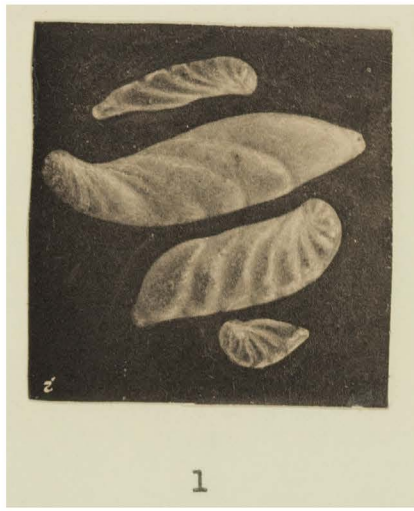
PLATE V

PLATE V

Figure 1. Cristellaria crepidula Fichtel and Moll, recent specimens.

Figure 2. Cristellaria gibba d'Orbigny, (a, b), cretaceous specimens, x 60; (c), recent specimens.

PLATE V



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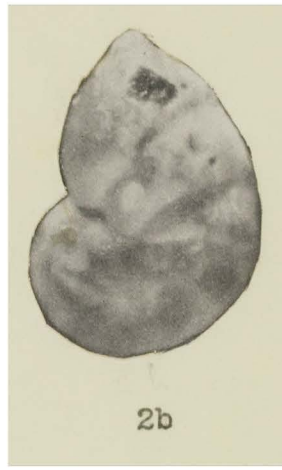
2a



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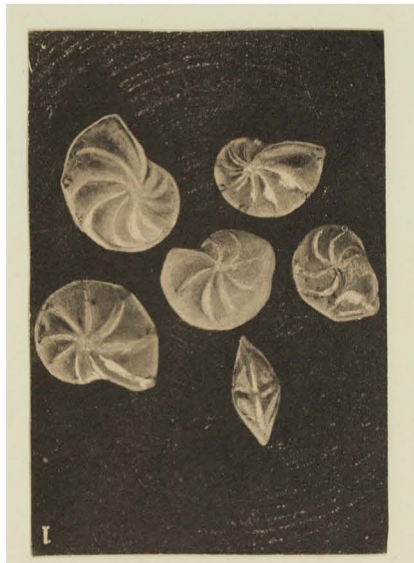


2c

PLATE VI

PLATE VI

Figure 1. Globigerina cretacea d'Orbigny, (a), ventral view; (b), dorsal view, x 35, cretaceous specimens.

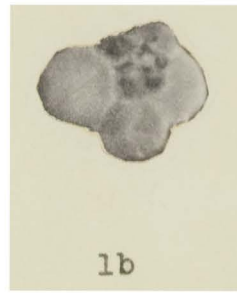
Figure 2. Polymorphina lactea (Walker and Jacob), (a, c), side views; (b), apertural view, x 50. Drawings.

Figure 3. Frondicularia projecta Carsey, x 35. cretaceous specimen.

Figure 4. Marginulina regularis d'Orbigny, x 50. Drawing.

PLATE VI.

1a



1b

2a

2b

2c

3

4

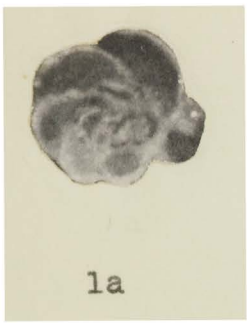
PLATE VII

PLATE VII

Figure 1. Globigerina rosetta Carsey, (a), dorsal; (b), ventral, x 35. Cretaceous specimens. (c), dorsal; (d) Peripheral; (e), ventral, x 50. Drawings.

Figure 2. Discorbis correcta Carsey, (a), dorsal view; (b), ventral view, x 53. Cretaceous specimen.

PLATE VII.



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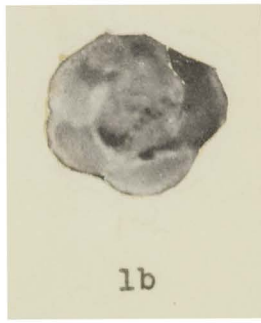

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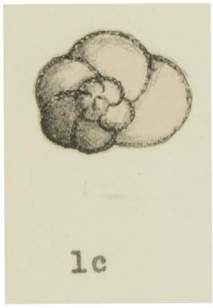
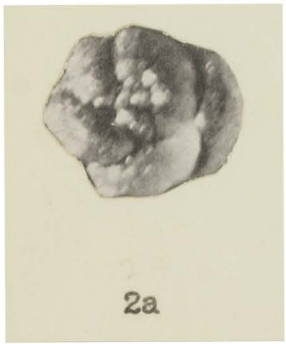


1c

1d

1e



2a

2b

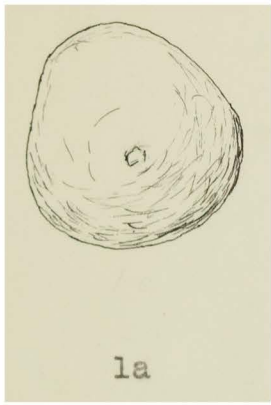
PLATE VIII

PLATE VIII

Figure 1. Discorbis conica N. Sp., (a), dorsal view; (b), ventral view; (c), peripheral view.

Figure 2. Truncatulina bouldini N. Sp., (a), ventral view; (b), dorsal view.

PLATE VIII



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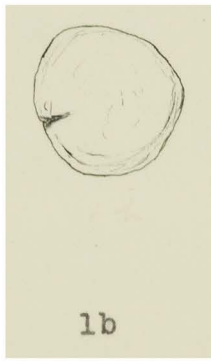
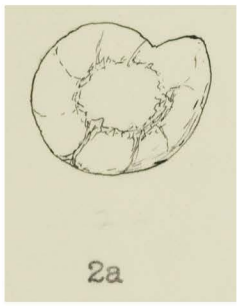
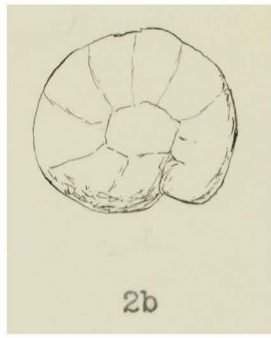


1b

1c



2a



2b

PLATE IX

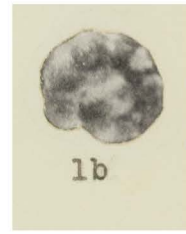
PLATE IX

Figure 1. Rotalia cretacea Carsey, (a), dorsal view; (b), ventral view, x 53, cretaceous specimen.

Figure 2. Lithistid sponge spicules, (a, b), different cretaceous specimens.

PLATE IX.

1a



1b

2a

2b

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